B The expenditure share of people experiencing problems

B.1 Why are spending shares policy relevant?

As noted in chapter 5, while the prevalence rate of problem gamblers in the adult population is relatively small, of greater importance is the fact that they represent a much larger share of regular gamblers (the policy-relevant risk group). The expenditure share of people experiencing problems is relevant to policy, as it:

- is directly related to the harms associated with gambling
- reduces the estimated total 'consumer surplus' associated with gambling (chapter 6)
- may weaken the incentives for action or effective implementation of measures by venues to prevent and address problem gambling, since these have effects on their revenues (and for governments, taxes)
- affects judgments about the appropriate onus of proof regarding some types of gambling regulations — and, in particular ones that are aimed at reducing spending below high levels (such as limits on the bet amount, as discussed in chapter 11, or pre-commitment, as discussed in chapter 10). For instance, the Commission has undertaken empirical research to assess the extent to which a one-dollar bet limit (per push of the EGM button) would inconvenience recreational gamblers (seemingly, not a lot) compared with problem gamblers (a lot).[1]

The key point is that spending shares are relevant to the need for harm minimisation, the form it takes and judgments about the evidentiary burden for making decisions.

[1] Some might argue that the standard of proof that most recreational gamblers suffer little inconvenience should be 'beyond all doubt'. However, if problem gamblers account for a high share of spending, it could be argued that that onus of proof should be weakened for regulatory measures aimed at curbing high intensity playing. Indeed, it might be appropriate to show that a bet limit *above* one dollar is likely to be 'safe'.

B.2 Conceptual and methodological issues

There are significant difficulties in calculating the spending share of problem gamblers and of gamblers experiencing particular harms.[2] Several studies have found that people have poor and understated recall of spending. For instance, the ABS Household Expenditure Survey finds household spending on gambling overall is only around 14 per cent of the (accurately) measured spending based on tax/industry data, while spending on gaming machines is less than three per cent of true spending (table B.1).[3] People collectively report net winnings when playing casino table games. Only spending on lotteries corresponds to the true amount. People's recollections of spending on alcohol and tobacco products — while also showing under-reporting — is far closer to the true amounts.

It appears that wins have more salience to gamblers than losses, and that there is a reluctance to acknowledge spending on areas that are perceived to be socially stigmatised.

In some other studies, though, spending estimates appear to be higher than the true amounts, reflecting the fact that some people identify spending as amounts *staked*, rather than as amounts lost (Blaszczynski et al. 2008 and box B.1). Accordingly, the results of any expenditure study depend on the methodology used.

In reviewing the CPGI, McCready and Adlaf (2006) sought the views of a variety of gambling experts. While there was no consensus among the respondents to the survey, their summary of the experts' views suggested:

> … there is considerable doubt about subjects' ability to accurately recall and estimate gambling frequency, duration and spending … causing a significant number to consider the data unreliable due to under-estimating and under-reporting … Whereas many respondents believe the CPGI addresses spending on gambling as well as any instrument, there are concerns about this area. Respondents suggest that ... gamblers have problems remembering the amount spent over any period of time ... it was suggested that it might be easier for people who play the lottery to remember what they spent than for those who play machines; it was suggested that problem gamblers might not want to report accurate money amounts over the telephone when other people in the house can hear the conversation.

Given these and other uncertainties, Delfabbro (2008, p. 89) considered that:

> … it is likely that expenditure estimates based on gambling surveys will be of limited value from a public health or regulatory perspective.

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2 For example, Delfabbro (2008 pp. 88-89), Volberg et al. (2001); Blaszczynski et al. (1997, 2006, 2008); and Williams and Wood (2004, 2007).

3 These results may partly reflect the form of the diary-based method used in that survey.

However, the expenditure share of problem gamblers has strong relevance to public policy, as discussed above and in chapter 5, so that even highly approximate estimates can be useful.

Gambling is not unique in the difficulties identified by McCready and Adlaf, Delfabbro, Blaszczynski and others. There are equal or worse difficulties in measuring many social phenomena relying on self-reporting — domestic violence, road rage, sexual assault, and substance abuse — and a similar set of concerns in getting marketing information about all manner of purchasing or lifestyle issues for commercial enterprises.

Unless it is genuinely the case that there is *no* evidence, there are strong grounds for trying to place bounds on such highly policy-relevant numbers as problem gambling prevalence rates and expenditure shares.

Table B.1 **People under-report their gambling**

Household Expenditure Survey (HES) 2003–04

	HES	*Reliable data*	*Share of true value*
	$m	$m	%
All gambling	2,204	16,247	13.6
Lottery/Lotto/scratchies	1,545	1,601	96.5
EGMs	306	10,651	2.9
Table games	-56	1,593	..
Other	410	2,402	17.1
Cigarettes and tobacco	4,646	9,634	48.2
Alcohol	9,381	14,792	63.4
Food	61,494	54,445	112.9
Electricity, gas and other domestic fuel	9,489	10,154	93.5
Household equipment and furnishings	20,918	27,598	75.8
Communications	12,490	13,861	90.1
Clothing & footwear	14,184	18,445	76.9
Rent	18,745	20,970	89.4
Total transport	56,015	58,499	95.8
Total household consumption	333,161	427,572	77.9

a The table is based on the most recently available HES (2003–04). In the case of gambling, reliable data are from the statistics compiled by state and territory governments (Australian Gambling Statistics 2006–07, 25th edition). Reliable measures of off-premises sales of alcohol are from the ABS National Accounts (Cat. No. 5204.0), combined with data of on-premises sales by hotels, clubs and others (ABS 2006, *Clubs, Pubs, Taverns and Bars 2004–05*, Cat. No. 8687.0). The latter relate to 2004–05, but that should not unduly affect the comparison with the HES. All other reliable data are from the National Accounts. In order to put them on the same conceptual footing, total household consumption excludes imputed rent from the national accounts data and excludes interest payments from the HES.

*Source*s: As described above.

Box B.1 **Dollars and sense**

Blaszczynski et al. (2008) undertook a unique experiment in which they examined:

(a) a self-reported daily record compared with a recall-based spending measure. The former was around 60 per cent higher than the latter — the implication being that people forget their spending amounts

(b) a self-reported daily measure that explicitly requested *net* spending compared with a daily reported measure that did not make this distinction clear. The former was 33 per cent lower than the latter — the implication being that people can confuse cumulative amounts staked and actual losses made.

Intriguingly, to the extent that the net spending figure based on a daily record is the 'gold standard', the counteracting biases affecting recalled spending cancelled out, so that the recall-based spend was within around 5 per cent of the net spending amount. So, in fact, relatively simplistic measures may not be as poor as thought.

However, it is unclear to what extent the study's findings can be generalised, due to a very small sample rate, the high attrition in respondents over the course of the study, and the involvement of people with relatively high average monthly spends. Nevertheless, the study has good face validity.

In fact, there is a range of methods that can be used concurrently to estimate the share of spending accounted for by problem gamblers. Biases in people's declared spending may be less of an issue to the extent that:

- higher risk gamblers face similar biases as other gamblers. There is evidence for this from detailed research on the ambiguities of different spending approaches (Williams and Wood 2004, pp. 42–43)
- carefully constructed measures are used (as in the net spending measures used in the ACT prevalence study and in the Canadian research undertaken by Williams and Wood (2004, 2007)
- recall biases (which tend to underestimate spending) are balanced by the propensity for people to confuse amounts staked with spending (which overstates spending, as evident in box B.1)
- a variety of studies are used to reduce the problems associated with small samples of higher risk gamblers and the potential for outliers to influence the results
- indirect methods are used (as discussed below).

Using a range of methods increases reliability

The Commission used multiple methods to estimate expenditure shares, reflecting the inadequacies of existing data and the desirability of 'triangulated results'. Where the problem gambling screen was not applied to all gamblers (because they were non-regular gamblers), it has been assumed that all non-respondents are no-risk (or 'recreational') gamblers. All other things being equal, this will tend to underestimate the shares for higher risk groups, since some non-regular gamblers do experience problems.

Outliers bedevil some estimates of spending shares, because:

- some people exaggerate or understate their playing intensity or spending
- imputing annual spending on the basis of 'typical' playing styles may not always provide good estimates of spending at the individual level, even if, when averaged, it is a satisfactory measure of the behaviour of groups of individuals. In particular, very high spending amounts will be estimated for someone who says that they typically play at high intensity across *all* the options (lines, credits, minutes playing and sessions).

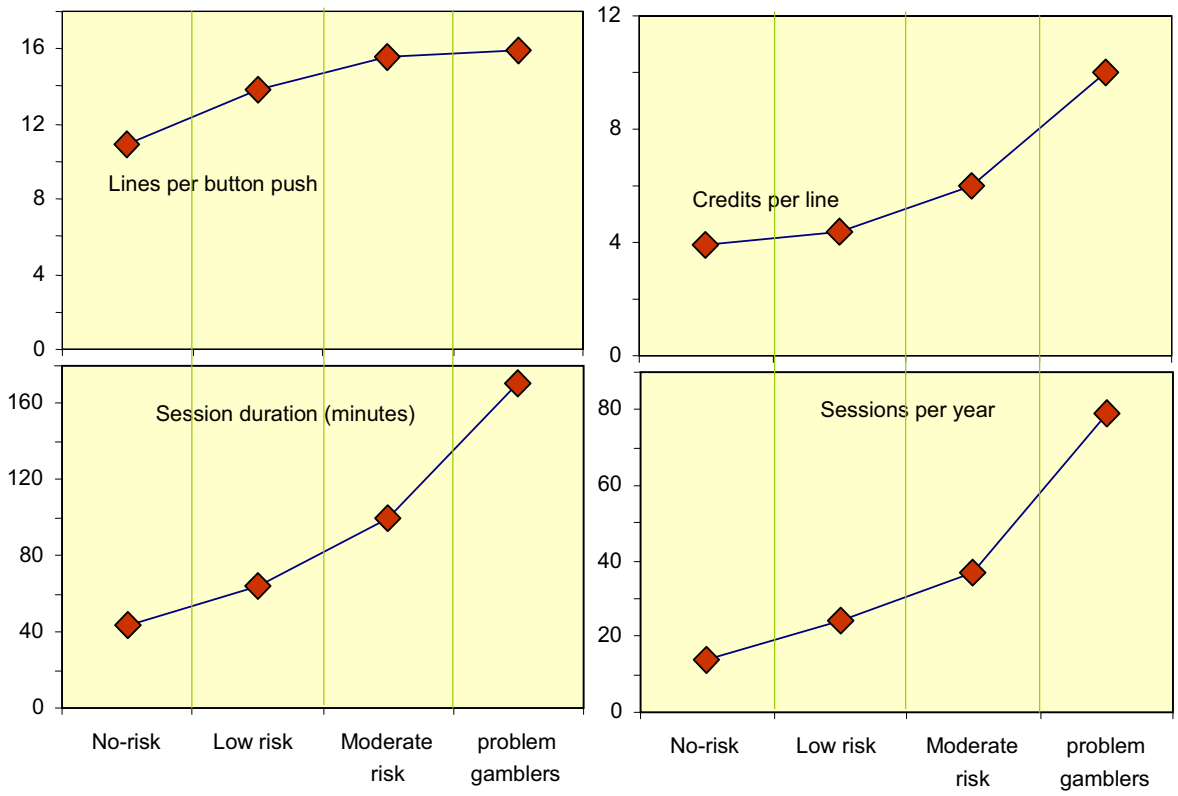
Accordingly, at least in some surveys, a few gamblers in each risk group recorded spending levels of $250 000 a year or more. While, in fact, some gamblers effectively do spend this much — as suggested by the data on fraud and on a particular loyalty scheme shown below — that kind of spending is very infrequent. As a result, the Commission usually used so-called 'robust' techniques that reduced the influence of outliers (so-called Winsorised[4] and trimmed means).

Method 1: the 'player style' approach

Many Australian prevalence surveys have asked gamblers about their customary playing style on EGMs, which can be used to estimate their annual spending. Even cursory examination of the data reveals that problem gamblers are much more likely to be regular players, to play more intensively and, accordingly, to spend more than recreational gamblers (figure B.1). Accordingly, they must account for a bigger share of total spending than their prevalence rate. However, the key question is by how much.

[4] 'Winsorising' involves setting all outliers to a specified percentile of the data. For example, a 10 per cent upper Winsorised mean would be calculated by setting all values in the top 10 per cent of the sample to the 90th percentile. Winsorising does not exclude outliers from the data altogether, but moderates their influence.

Figure B.1 **Intensity rises with gamblers' risk status**



Data source: Queensland Prevalence Survey, 2006–07.

One way of assessing this is to derive an indirect measure of spending from playing styles. To the extent that people have a typical style of play, an accurate indirect measure of annual spending (S_R) on gaming machines for any given risk group (R) is the aggregate across individuals of any given risk group:

$$S_R = \sum_{i=1}^{n} Spend_i = \sum_{i=1}^{n} \{L_i \times C_i \times B_i \times M_i \times D_i \times S_i \times (1 - \tau_i)\}$$

where:

- L are lines selected
- C denotes credits staked per line
- B is the number of effective button pushes per minute. The minimum speed of play is regulated and could allow up to 20 button pushes per minute. However, in many cases, such regulated spin rates will not be binding because people want to play slower and because some games have free features, where no credits are staked. A reasonable estimate is that play would involve around 12 button pushes per minute for most players
- D is the machine denomination (for example, 1 cent, 2 cents and so on)

- M is the number of minutes per session
- S is the number of sessions of gambling per year (for example, 52 for someone who play once a week)
- τ is the rate of return on machines — typically between 90 and 92 per cent. The expected loss rate on a machine is therefore (1-τ)
- i = 1 to n are the individuals in a given risk group.

S_R can then be added up across risk groups to estimate total annual spending (S) and expenditure shares (α) for each risk group:

$$S = \sum_{R=1}^{4} S_R \quad \textit{and} \quad \alpha_R = \frac{S_R}{S}$$

While surveys have not asked people about their playing speed (button pushes per minute) or the rate of return on machines, they have sometimes collected data on the other key elements of this identity. Accordingly, the same average values have been used for B and τ (that is 10 and 0.1 respectively, whose effects cancel out). The absence of unit record data for these elements is not likely to be important. There is no compelling evidence that people in different risk categories systematically push the buttons on machines slower or faster than each other, or that they play higher or lower returning machines. And, while some people do in fact win overall on gaming machines in a given year, over a large group of people, the actual rate of return will converge to its expected value (τ).

The measure above has some advantages over direct measures as it does not require people to differentiate between amounts staked and net expenditure, and does not require them to divulge what may be a sensitive spending figure.

Method 2: the 'means' approach

Method 2 is similar to above. In some instances, the unit records needed to calculate estimates of individual spending are not available because access to unit records is costly or not possible. In this case, spending of a given risk group (R) can be estimated as the product of the averages for that risk group of each of the relevant components of the formula given above, times the relevant population size:

$$S_R = \{\overline{L}_R \times \overline{C}_R \times \overline{B} \times \overline{D}_R \times \overline{M}_R \times \overline{S}_R \times (1 - \overline{\tau})\} \times POP_R$$

The validity of the latter method is dependent on strict assumptions, and so it is probably less reliable as a measure of spending shares (box B.2).

Box B.2 **Limitations of the means approach**

To illustrate the difficulties with the 'means' approach, consider the case where there are just two factors making up intensity (S), say X and Y, so that the total value of intensity for a given risk group is:

$$S_R = \sum_{i=1}^{n} X_i.Y_i$$

Now a proxy for this is the multiple of the relevant means (times the population of the risk group):

$$\widetilde{S}_R = POP_R.\overline{X}_R.\overline{Y}_R$$

Each X_i and Y_i are deviations from the mean value, with those deviations represented by ε and η:

$$X_i = \overline{X}_R + \varepsilon_i \text{ and } Y_i = \overline{Y}_R + \eta_i$$

Accordingly,

$$S_R = \sum_{i=1}^{n} X_i.Y_i = \sum_{i=1}^{n} (\overline{X}_R + \varepsilon_i) \times (\overline{Y}_R + \eta_i) = POP_R.\overline{X}_R.\overline{Y}_R + \sum_{i=1}^{n} \varepsilon_i.\eta_i = \widetilde{S}_R + \sum_{i=1}^{n} \varepsilon_i.\eta_i \,,$$

noting that the sums of the deviations are zero. Accordingly, the bias in the proxy measure depends on how deviations are correlated. If they tend to be inversely correlated so that a high value of ε tends to be associated with a lower value of η, then the proxy will be more than the true measure (while positive correlations will lead to the opposite bias). If the correlations between the deviations are much the same for each different risk group, that need not matter for the *shares* of each risk group:

$$\alpha_R = \widetilde{S}_R / \sum_{R=1}^{4} \widetilde{S}_R$$

However, if the correlations between ε and η vary in each different risk group then that will lead to biases in the shares as well.

The second problem stems from outliers. If there are spurious outliers in the data, then these can be dealt with when unit record data are available, but not when only the averages are publicly available (as is sometimes the case).

So, sometimes the 'means' approach will give acceptable estimates of expenditure shares, but its accuracy is underpinned by certain characteristics of the dataset that generated the means.

The possible accuracy of the 'means' approach can be tested where a unit-record based method can be used to validate it, but the result in one dataset may not carry over to others.

Method 3: The 'biggest loss' approach

Some surveys provide data on the biggest loss experienced by gamblers, which can be used to provide another measure of spending. The biggest loss experienced by an individual is some share of their average loss. Accordingly, subject to a range of assumptions about the ratio of typical losses to big losses, it is possible to derive a pseudo measure of average losses per session.

The more risky the player, the more likely that the biggest loss will be significantly higher than the typical loss. Recreational gamblers are likely to have a normal spend relatively close to their biggest loss, because they usually stake smaller amounts and with small variability.

We have assumed that normal spending per session is 80 per cent of the maximum loss for this group, while the typical loss per session is 50, 30 and 15 per cent of the biggest losses for low risk, moderate risk and problem gamblers respectively. (We have deliberately chosen low rates for the more risky groups to generate conservative estimates of the spending share of problem gamblers.) As before, aggregate spends (and shares) can then be derived by multiplying sessions by derived average session losses. (The sensitivity of the results to these assumptions can be readily estimated).

Method 4: Number of times losses exceed $50

In the South Australian prevalence survey, EGM players were asked about the number of times per year that they have lost $50 or more. With manipulation and assumptions, these data can be used to estimate a net spending measure. The number of sessions played by each EGM gambler is known, as is the corresponding number of times they have lost $50 or more. This provides an estimate of the share of sessions when the gambler loses more than $50.

For each of the four risk groups, we make assumptions about the average spend in those sessions where a person's losses are under $50 ($u$) and the average spend when they make a loss of $50 or more ($h$), noting that averages will be strongly skewed.

It is assumed that u is a modest share of $50 for recreational players, while average losses when people lose more than $50 is also modest. For higher risk groups, the value of u rises closer to $50 and the value of h becomes a more significant multiple of $50. The values of u were $20, $30, $35 and $45 for the four different risk classes for recreational gamblers — low-risk, moderate-risk and problem gamblers

respectively.[5] The corresponding values of *h* were \$150, \$225, \$300 and \$400. Using these parameters, estimates of average session losses and annual spending can be derived for each individual and summed to give total spending, from which expenditure shares can be calculated. (A common value of *u* and *h* are chosen for every individual in any given risk class)

Method 5: Average session losses

In some instances, respondents are asked about their losses (or wins) in their last gambling session. When multiplied by session numbers this provides an estimate of annual spending. Ideally, data on wins and losses would be used. However, when this approach was used it resulted in people winning overall (an outcome that has also been found in some other studies, and likely to reflect the higher salience of wins). More plausible results were derived if wins were stripped from the data. Williams and Wood (2007) found that using this approach gave similar results to diary-based approaches, but tended to underestimate the spending share of gamblers rated as CPGI8+.

Method 6: Direct estimates of annual spending

In some cases, as in the Victorian 2008 prevalence survey (Hare 2009), players were asked to estimate their annual spending on gambling.

Method 7: The case study approach

Clubs Australia provided the Commission with a sample of data over some months on spending and time spent gambling on EGMs from loyalty members in a large Australian club. The Commission is not aware of the jurisdiction in which this club is located or its name, nor the identities of the individual players concerned. The data were stratified by the five loyalty classes of the members (based on expenditure levels). There were only 30 members in the top group and many thousands in the bottom. The Commission was provided with the aggregate player losses and turnover for each loyalty group. In addition we were provided with samples of unit record data of turnover, spending and time spent for each loyalty group. The Commission has all the unit data for the highest spending stratum and samples for the other groups, with the sampling proportion falling as the number in each group increases.

[5] Clearly, actual u and h would vary for each individual in each risk class, but applying a common number across individuals may still provide a guide to each person's spending, with the errors resulting reduced through averaging across the individuals in each risk group.

There are no data on the risk categories of the players concerned. However, the data are useful in several respects:

- If the hypothesis that problem gamblers account for a large share of spending is correct then it implies that expenditure should be concentrated among a few players. If that were not the case, then this would cast doubt on the hypothesis. Finding it is concentrated does not, absent other evidence, provide evidence for the hypothesis
- Data from other prevalence surveys can be used to indicate the likelihood that a person spending a certain amount is likely to be a problem gambler. Combining the evidence can be used to estimate the share of spending accounted for by problem gamblers
- It provides evidence on the behaviour of gamblers (sessions, wins/losses, time spent) that helps substantiate or undermine evidence from other surveys about the behaviour of different risk groups.

B.3 The results show high risk groups have high spending shares

Results based on the Commission's analysis of Australian prevalence surveys

A consistent picture develops from the collective evidence that problem gamblers account for a substantial share of total gaming machine spending (summarised in table B.2, based on results from tables B.3 to B.19). The minimum spending share is 22 per cent and the maximum 60 per cent. The average was 41 per cent and the median 39 per cent.

As discussed in chapter 4, many people rated as moderate risk have already developed significant problems, and are exposed to the risk of progressing to problems in the future. Not surprisingly, given their lower risk status, this group accounts for a smaller share of total spending (between 7 and 27 per cent), with an average of 19 per cent (median of 20 per cent).

Given the variability associated with different sample sizes and methods for calculating the shares, the combined risk category CPGI 3+ probably gives a more reliable estimate of the relative spending of higher risk gamblers. It ranges from 42 to 74 per cent, with an average of 60 per cent (and shows the least variability

relative to its mean, suggesting a reasonable degree of reliability).[6] This group has often been used as the basis for calculating problem gambling shares, for instance in the Canadian studies of Williams and Wood (2004, 2007), though the Commission has concentrated on the highest risk group (CPGI 8+) when discussing problem gambling.

The results above have good face validity given the data on playing styles of various risk groups. In particular, problem gamblers play many more sessions per year than other gamblers and play for longer during such sessions. That behavioural combination equates with very high spending amounts.

It also should be noted that — other than under the less reliable 'means' approach — the aggregate spending level suggested by the above measures is always below the known measure of expenditure on gaming machines.[7] Accordingly, there is 'missing money'. If all of the missing money were accounted for by the no-risk or low-risk groups then that would, by definition, lower the share of the higher risk groups.[8] However, it would generally not be appropriate to adjust the expenditure level of just one group, especially given that problem gamblers have a tendency not to participate in prevalence surveys. In that context, the shares given above probably remain the best estimates.

It is important to emphasise that it would be wholly unjustified to draw any conclusions from the estimates in tables B.2 to B.14 about the *ranking* of states and territories with respect to expenditure shares. The data is simply not reliable enough to support such comparisons. That is why table B.2 does not specify the jurisdictions from which the estimates have been derived.

The estimates in table B.2 include additional studies and some elaboration of methods compared with the draft report, which is why the numbers vary slightly. The average estimates are almost identical to the draft report.

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6 The coefficient of variation (the standard deviation of the measures divided by the mean) gives a normalised measure of variation. It is lowest for CPGI 8+ of the four risk groups (26 per cent). But the value for the combined risk group CPGI 3+ (14 per cent) is much lower than any other individual risk group.

7 Though reasonably close matches were obtained for the Tasmanian data (method 1 and 5) and Queensland (method 1).

8 Ignoring the 'means' method, where the estimated spending was *above* the true level, adjusting the expenditure shares of higher risk groups so that all of the missing money was accounted for by the lower risk groups would imply an average expenditure share for CPGI 3+ group of 30 percent and for CPGI 8+ groups of 21 per cent — which remain highly policy relevant.

Table B.2 **Summary of empirical estimates of the spending share**

Risk group	*Expenditure shares from tables B.3 to B.19*											
	%	%	%	%	%	%	%	%	%	%	%	%
Recreational	35	35	19	16	16	31	37	18	15	18	29	27
Low risk	10	9	11	12	10	16	21	16	15	20	22	15
Moderate risk	20	22	17	12	19	8	20	27	23	24	16	17
Problem gambler	35	34	54	60	55	45	22	39	47	38	33	41
CPGI 3+	55	56	71	72	74	53	42	66	70	62	49	58

Risk group	*Expenditure shares from tables B.3 to B.19 continued*										
	%	%	%	%	%	%	%	%	%	%	%
Recreational	43	31	29	24	17	32	30	29	27	24	22
Low risk	9	10	11	14	11	16	17	11	11	17	16
Moderate risk	21	20	21	26	21	26	25	7	9	23	19
Problem gambler	26	39	38	36	51	26	28	52	53	36	44
High risk	47	58	59	62	72	51	53	59	62	59	62

Source: Derived from the tables below.

Table B.3 **EGM player behaviours, NSW 2006**

By risk group[a]

	Lines	*Credits per line*	*EGM denomination*	*Sessions per year*	*Session duration*
	number	number	cents	number	minutes
Recreational gamblers	14.3	5.1	8.0	17.3	55
Low risk gamblers	16.6	5.8	7.6	52.3	72
Moderate risk gamblers	16.7	6.3	13.2	54.5	76
Problem gamblers	16.4	6.8	17.9	68.1	119

[a] Results are averages for each risk group.

Source: Unit record data analysis of NSW prevalence study 2006.

Table B.4 **Shares of total EGM expenditure, NSW 2006**

By risk group[a]

Risk group	*Mean annual EGM spending per person*	*EGM gamblers*	*Spending*	*Share of total spending*	
				Method 1	Method 2
	$	Number	$m	%	%
Recreational gamblers	696	1 357 869	945	35	35
Low risk gamblers	3 668	75 042	275	10	9
Moderate risk gamblers	6 618	80 945	536	20	22
Problem gamblers	20 642	46 228	954	35	34
Total	1 737	1 560 084	2 710	100	100

a Given some extreme outliers that were clearly affecting the results, the value of EGM spend (S as defined above) is based on a 10 per cent Winsorised trim. Extremes for spending are the result of people simultaneously stipulating high values for all of the underlying variables (such as high lines, credits and sessions). In undertaking unit record analysis of each player, where the average implied amount wagered per button push exceeded $10 for any player (the maximum allowed in NSW), the value was set to $10.

Source: Based on unit record analysis of NSW prevalence study 2006.

Table B.5 **EGM player behaviours and average annual spending per person, Tasmania 2007**[a]

By risk group

Risk group	*Sessions per year*	*Average session duration*	*Loss per session*	*EGM players*	*Method 5 annual spend*			*Method 3 annual spend*
					Untrimmed mean	5% trimmed	5% Winsorised	
	Number	Minutes	$	Number	$ per person	$ per person	$ per person	$ per person
Recreat-ional	9.4	39.0	18.2	100 117	180	104	139	316
Low risk	41.0	61.5	141.4	2 936	3 501	2 789	3 051	5 583
Moderate risk	28.1	137.5	91.3	2 528	6 466	3 134	6 463	3 201
Problem gambler	138.9	143.7	196.1	1 889	27 663	21 147	25 820	24 373

a With the exception of the number of EGM players, data are averages calculated from unit record data. Trimmed and Winsorised means were estimated to check the potential effects of extreme values.

Source: Unit record analysis of the Tasmanian prevalence study 2007.

Table B.6 **Shares of total EGM expenditure, Tasmania 2007**

By risk group

Risk group	*Method 5*			*Method 3*
	Untrimmed	*5% trimmed*	*5% Winsorised*	
	%	%	%	%
Recreational	19	16	16	31
Low risk	11	12	10	16
Moderate risk	17	12	19	8
Problem gambler	54	60	55	45

Source: Unit record analysis of the Tasmanian prevalence study 2007.

Table B.7 **EGM player behaviours and spending shares, Queensland 2006–07**

By risk group

Risk group	*Lines*	*Credits per line*	*EGM denomination*	*Sessions per year*	*Minutes per session*	*Spending share method 2*
	Number	Number	$	Number	Minutes	%
Recreational	10.9	4.0	0.04	14.0	43	18
Low risk	13.8	4.4	0.08	24.3	64	21
Moderate risk	15.5	6.0	0.06	37.0	99	24
Problem gambler	16.0	10.0	0.06	79.2	171	38

a The questionnaire did not ask respondents to estimate their usual choices of lines and credits, but rather gave a Likert scale (never, rarely, and so on) about the likelihood that respondents played more than one line or credit per line, and when they did this, the number of lines/credits. We assigned probabilities to the Likert scales to produce estimates of lines/credits per line for each respondent. For example, if a person said that they played more than one line rarely, and when they did so, played 5 lines, the estimate of lines was 1*(90% probability) + 5*(10% probability), equalling 1.4 lines as the average line-playing style for that respondent. The probabilities for rarely, sometimes, often and always were 10, 30, 70 and 100 per cent respectively. A similar approach was used for credits per line.

Source: Queensland prevalence survey 2006–07.

Table B.8 **Shares of total EGM expenditure, Queensland**

By risk group, method 1, 2006–07

	5% Winsorised		*10% Winsorised*	
	Average spend per year	Share of total	Average spend per year	Share of total
	$	%	$	%
Recreational gamblers	176	18	115	15
Low risk gamblers	837	16	629	15
Moderate risk gamblers	3 867	27	2 607	23
Problem gamblers	20 370	39	19 689	47
Total	770	100	613	100

a Spending levels for each individual were calculated based on the methods described in the previous table, with trimming using Winsorised trims to address outliers. In undertaking unit record analysis of each player, where the average implied amount wagered per button push exceeded $5 for any player (the maximum allowed in Queensland), the value was set to $5.

Source: Unit record analysis of the Queensland prevalence survey 2006–07.

Table B.9 **Shares of total EGM expenditure, Queensland 2006–07**

By risk group, method 5

	Average loss per session	*Average spend per year*		*Number of people playing EGMs*	*Share of total spend*	
Risk group		*Untrimmed*	*5% Winsor*		*Untrimmed*	*5% Winsor*
	$	$		Number	%	
Recreational gamblers	20	376	224	685 785	29	27
Low risk gamblers	43	1 536	688	126 753	22	15
Moderate risk gamblers	77	2 937	2 128	47 412	16	17
Problem gamblers	283	22 984	18 246	13 090	33	41
Total	30	1 023	660	873 040	100	100

Source: Queensland prevalence survey 2006–07

Table B.10 **Shares of total EGM expenditure, Queensland 2008–09**

By risk group, method 1[a]

	Average spend per year			*People playing EGMs*	*Share of total spend*		
Risk group	Untrimmed	5% Winsor	10%		Untrimmed	5% Winsor	10%
	$	$	$	Number	%	%	%
Recreational gamblers	648	298	239	898 886	43	31	29
Low risk gamblers	1 184	866	798	102 465	9	10	11
Moderate risk gamblers	7 125	4241	3 874	40 013	21	20	21
Problem gamblers	33 246	31 422	26 436	10 565	26	39	38
Total	1 273	816	695	1 051 929	100	100	100

a The 2008–09 study did not have data on lines and credits played by different risk groups. In order to get an estimate of spending, each member of the relevant risk groups were assumed to have the average playing style for that risk group based on the Queensland 2006–07 survey. Data on machine denomination, session duration and annual sessions were still available. In undertaking unit record analysis of each player, where the average implied amount wagered per button push exceeded $5 for any player (the maximum allowed in Queensland), the value was set to $5.

Source: Queensland prevalence survey 2008–09.

Table B.11 **EGM playing style, South Australia 2005**

By risk group

Risk group	*Lines*	*Credits per line*	*EGM denomination*	*Sessions per year*	*Times lost $50 or more*
	Number	Number	Cents	Number	Number
Recreational gamblers	8.6	2.0	7.0	10.8	0.8
Low risk gamblers	13.5	2.3	6.7	33.4	5.8
Moderate risk gamblers	12.8	3.0	10.0	41.5	18.1
Problem gamblers	12.0	4.4	12.6	79.3	33.4

a The results show the averages for each risk group.

Source: South Australian prevalence study 2005.

Table B.12 **EGM spending and expenditure shares, South Australia 2005**

By risk group, Method 1

		Untrimmed		*5% Winsor*	
	EGM players	Annual average spend	Share of total spending	Annual average spend	Share of total spending
	number	per person	%	per person	%
No risk	323 327	223	24	106	17
Low risk	23 388	1 774	14	985	11
Moderate risk	13 329	5 686	26	3 258	21
Problem gambler	4 896	21 728	36	21 729	51

a An initial estimate of the average annual spend for each person was calculated as the multiple of the lines, credits per line, denomination and sessions per year and aggregated into an estimate of the aggregate spend for each risk group. However, the South Australian data has no record of minutes played per session, which, as is clear from the NSW, Queensland and Tasmanian data, tend to steeply increase with risk. Accordingly, the initial estimate of the average annual spend was multiplied by the average session duration for each risk class from the Queensland data. In undertaking unit record analysis of each player, where the average implied amount wagered per button push exceeded $10 for any player (the maximum allowed in South Australia), the value was set to $10.

Source: South Australian prevalence study 2005.

Table B.13 **EGM spending and expenditure shares, South Australia 2005**

By risk group, Method 4

	Untrimmed		*5% Winsor*	
	Annual average spend	Share of total spending	Annual average spend	Share of total spending
	per person	%	per person	%
No risk	295	32	243	30
Low risk	2 069	16	1 916	17
Moderate risk	5 649	26	4 964	25
Problem gambler	15 477	26	15 173	28

Source: South Australian prevalence study 2005.

Table B.14 **EGM playing style, Victoria 2003**

By risk group

Risk groups	*Lines*	*Credits per line*	*Denomination*	*Sessions*	*Session duration*
	number	number	cents	per year	minutes
Recreational	8.9	2.0	10.5	7.8	48.8
Low risk	9.1	1.7	7.7	35.8	105.5
Moderate risk	10.0	2.1	11.2	40.3	96.0
Problem gambler	10.0	2.5	4.5	115.8	169.3
Total	9.0	2.0	10.2	12.9	55.9

a The results show the averages for each risk group. Only gamblers who played regularly on relevant forms of gambling were asked the CPGI. The survey only asked people if they played more than one line or credit. It was assumed that if they said yes, they played ten lines and three credits— close to the average playing style for gamblers playing more than one line from the South Australian data. This will tend to underestimate actual lines and credits for higher risk groups. In undertaking unit record analysis of each player, where the average implied amount wagered per button push exceeded $10 for any player (the maximum allowed in Victoria at that time), the value was set to $10.

Source: Victorian prevalence study 2003.

Table B.15 **EGM spending and expenditure shares, Victoria 2003**

By risk group, method 1

	EGM players	*Mean annual spend*		*Share of total spend*	
		Untrimmed	*5% winsor*	*Untrimmed*	*5% winsor*
	number	$ per person	$ per person	%	%
Recreational	1 133 284	395	253	29	27
Low risk	57 329	2 968	2 096	11	11
Moderate risk	29 043	3 897	3 284	7	9
Problem gambler	35 467	22 175	15 702	52	53
Total	1 255 123	1 209	843	100	100

a The results are untrimmed estimates. If untrimmed and trimmed estimates are calculated using the South Australian data by risk group for lines and credits played by those who select more than one line or credit, the results are: {17, 8, 6 and 69 – untrimmed} and {16, 9, 7 and 68 – 5% winsorised} for the four risk groups. The latter estimates suggest implausibly high problem gambling shares. More generally, some aspects of this survey are not consistent with results from other surveys. In particular, the number of problem gamblers is high relative to moderate and low risk gamblers and the average machine denomination is implausibly significantly higher for recreational gamblers compared with problem gamblers. The Victorian survey was unique in that it tested three problem gambling screens, and as such, the sample size for the CPGI groups (low risk to problem gamblers) were relatively small, and open to wider confidence intervals than other prevalence surveys.

Source: Victorian prevalence study 2003.

Table B.16 **EGM playing styles**

Victoria 2008

	Sessions per year	*Population*	*Average denomination*	*Sessions total*	
	Number	Number ('000)	Cents	Number ('000)	Share of total sessions
Non-Problem Gamblers	7.08	638	6.0	4 517	47.0
Low Risk Gamblers	15.8	125	7.8	1 975	20.5
Moderate Risk Gamblers	22.73	73	9.6	1 659	17.3
Problem Gamblers	56.37	26	19.3	1 466	15.2

a The average denomination is the weighted average of the usual denomination played by EGM gamblers, with the assumption that where people indicated that they played a combination of denominations (around 5 per cent of players), the average was 5 cents.

Source: Analysis undertaken for the Commission by Sarah Hare (based on Hare 2009).

Table B.17 **Gaming machine lines played**

Victoria 2008

	Share betting more than 1 credit per line			
	Often	Always	Never, rarely or sometimes	All
	%	%	%	
Non-Problem Gamblers	11.0	22.5	66.5	100
Low Risk Gamblers	12.6	24.0	63.4	100
Moderate Risk Gamblers	17.3	31.9	50.8	100
Problem Gamblers	18.3	49.5	32.3	100

Source: Hare (2009).

Table B.18 **Relative spending levels by risk groups**

For those gamblers spending most on gambling machines, Victoria 2008

	No-risk	*Low-risk*	*Moderate risk*	*Problem gambler*
	$	$	$	$
Average annual spend	322	1 078	2 676	12 356

a The survey asked gamblers to estimate an annual spending amount for the gambling form where they had spend the most in the last year. These data have to be interpreted carefully because people who play EGMs, but spend more money on other forms of gambling, are omitted from the above calculations. Were the above estimates regarded as representative, then the problem gambling share of revenue would be 46 per cent and that of moderate risk gamblers an additional 24 per cent. However, these estimates may be biased — see the table below for an estimate that takes account of EGM players who spend more money on other forms of gambling.

Source: Based on analysis of unit record data from the Victorian 2008 survey.

Table B.19 **EGM spending and expenditure shares, Victoria 2008**
By risk group, method 6

	EGM players	*Mean annual spend*		*Share of total spend*	
		Untrimmed	*5% winsor*	*Untrimmed*	*5% winsor*
	number	$ per person	$ per person	%	%
Recreational	655 485	246	154	24	22
Low risk	128 432	865	570	17	16
Moderate risk	75 224	2 001	1 154	23	19
Problem gambler	26 459	9 095	7 660	36	44
Total	885 600	749	524	100	100

a The Victorian 2008 survey asked people to nominate annual spending on the gambling form on which they spent most. Where people nominated gaming machines (the EGMGAMB group), untrimmed and trimmed estimates of spending were calculated for the different risk groups. Corresponding to that, estimates of the total spending were obtained for each risk category in the EGMGAMB group by multiplying the average spending amounts by the size of the relevant populations. However, this is not sufficient to calculate spending shares, as some people playing EGMs (the OTHGAMB group) spend most on other gambling forms. It can be assumed that the average spend of OTHGAMB members is lower than those who spend most on EGMs. It was assumed that the average spend by recreational to problem gamblers respectively on EGMs of the OTHGAMB group was 15, 50, 75 and 100 per cent of the *overall* average spending of the EGMGAMB group. It was then possible to calculate spending shares that counted all EGM gamblers. The presumption that spending by those in the OTHGAMB group increases with risk status was confirmed with the data from the Tasmanian prevalence survey by examining EGM spending for those who played EGMs, but who did not consider it to be their 'favourite' form. To check the sensitivity of the results, various alternatives scenarios were considered. Even under the extreme assumption that all risk classes in the OTHGAMB group spend the same (one third of the overall average spending of the EGMGAMB group), then the moderate risk gambling share is 19 per cent and the problem gambling share is 32 per cent (untrimmed). The results were 15 and 39 per cent respectively for these risk groups if trimmed results were used.

Source: Based on analysis of unit record data from the Victorian 2008 survey.

Results based on the case study of a single club

The loyalty card data for the club in question reveal a very high degree of concentration of spending, with just 2.3 percent of loyalty card players accounting for 76.4 percent of turnover and a similar share of player losses (table B.18). It is important to emphasise that premium players are not necessarily problem players. In part, the spending profile shown below is just a more extreme example of the usual pattern of consumption for other goods and services. It is common for a small group of consumers to spend a relatively large amount of time and money on an activity, and therefore to comprise a significant share of total spending (the '80–20' rule). In the case of gambling, this shows up as high intensity play over long periods (table B.19).

> However, empirically, the higher the annual spending, the greater the likelihood of problem gambling. As shown in table B.20, in its 1999 study, the Commission found that around 65 per cent of those spending more than $12 000 a year on EGMs were problem gamblers. While the threshold value, $12 000 would have risen given

inflation, the pattern suggests that a significant share of the highest spending loyalty card players have problems. The loyalty card data could readily be consistent with problem gambling shares of total player losses of 35 per cent or more.

Two caveats should be made. The case study data:

- are based on just one (relatively large) venue over a particular period, and may not be typical
- do not take any account of non-loyalty card players or play by loyalty-card members who do not use their cards when playing.

Clubs Australia (attach, sub. DR359, p. 96) were sceptical of any conclusion that could be drawn from the data about problem gambling spending shares from these data (or as it happens from any dataset). It considered that:

> It is unlikely that there are "problem gamblers" in the loyalty program data supplied to the Commission. We know of no literature or research that would support any implication that problem gamblers are members of loyalty clubs. … No theoretical or evidential bases are provided that there are any problem gamblers in these data …

However, this is incorrect on several fronts. First, as shown above, the likelihood of problems rises significantly with spending. While that does not mean that a given *individual* who is a heavy gambler is a problem one, it means that among a *group* of such gamblers it is very likely that many of them are. Second, prevalence surveys have asked gamblers if they are members of loyalty card programs. These show that problem (and moderate risk) gamblers are often members of loyalty schemes. For instance, the 2006 NSW prevalence survey indicated that around 38 per cent of problem gamblers and 49 per cent of moderate risk gamblers were members. 36 per cent of no and low risk gamblers were members. Moreover, of those people who were members, around 54 per cent of problem gamblers and 60 per cent of moderate risk gamblers often or always inserted their cards into the machines. In contrast, 41 per cent of low and no risk gamblers did so.

Table B.20 **Dispersion in player spending**

All loyalty card members, September 2008 to February 2009

Loyalty scheme status	*Share of loyalty members*	*Share of turnover*	*Share of player losses*	*Loss rate*	*Annualised player losses*
	%	%	%	%	$ per loyalty card member
Class 1	0.1	17.2	13.0	7.0	86 020
Class 2	0.5	30.7	29.6	8.9	28 719
Class 3	1.7	28.5	30.8	10.0	9 823
Class 4	5.8	18.3	21.1	10.6	1 908
Class 5	91.9	5.3	5.5	9.4	31
all loyalty	100.0	100.0	100.0	9.2	527

a The club had five loyalty card groups, with a very few in the premium groups. (These are the several hundred people in classes 1 and 2, earning in the top echelon of loyalty bonus points.) The data relate to observations for each of the six months from September 2008 to February 2009. The data cover around 35 000 loyalty card members, noting that many club members will not have loyalty cards, and those who do, may not gamble in a given period or may only sometimes use their cards when playing. The low averages for class 5 players reflects the fact that in any given month, many do not play at all. To the extent that a proportion of such class 5 players do not gamble *at all* in a given year, the average annualised player losses for class 5 would be biased downwards. However, that bias — if present — does not affect the data on concentration of spending.

Source: Data from a large club in Australia, provided by Clubs Australia.

Table B.21 **Playing outcomes and styles**

Based on a sample of loyalty card data

Loyalty scheme status	*Average weekly hours played*	*Share losing in a month*	*Average amount wagered per button push*	Median amount wagered per button push	*Share with average spend >$1*
	Hours	%	$		%
Class 1	8.8	92	4.1	3.3	96
Class 2	4.7	73	2.3	1.4	67
Class 3	2	81	0.9	0.4	32
Class 4	2.8	91	1.0	0.3	30
Class 5	0.9	82	0.8	0.5	25

a The data related to monthly statements of around 130 gamblers between August 2008 and February 2009. Given that player records are available for some players for multiple months, overall there were data for between 294 to 326 months, depending on the variables concerned. The implication of the fact that the sampling unit is a month requires some care in the interpretation of the information above on the amount staked per button push. Ideally, to examine player behaviour for each button push, data on amounts staked for each button push would be collected for a large representative sample of players (including non-loyalty card players) over a week (or a month). Then for each player, it would be possible to calculate accurately the proportion of button push stake amounts that exceeded 50 cents, one dollar or any other amount. In that case, the effects on players of any regulatory measure relating to maximum stakes could be estimated. Absent that data, conjectures have to be based on more aggregated data, which will conceal some of the underlying variability of playing styles. To illustrate this point, the data above suggests that 25 per cent of the class 5 loyalty card members (the most numerous group) spend more than one dollar per button push on *average* in any given month. However, for that group, this outcome would be consistent with a circumstance in which 98.9 per cent of the time such gamblers spent 90 cents per button push and the remaining 1.1 per cent, they spent $10 per button push (giving an average spend of $1.001 for the months concerned).

Source: Data from a large unknown club in Australia, provided by Clubs Australia.

Table B.22 **Are big spenders more likely to be problem gamblers?**
Share of problem gamblers by annual net spending[a]

	Annual spending on gambling					*Prevalence rate of those who gamble*
	Net winnings or broke even	*$0–$3000*	*$3001–$6 000*	*$6 001–$12 000*	*More than $12 000*	
	%	%	%	%	%	%
SOGS 5+ definition of problem gambler						
EGMs	1.8	2.8	32.8	52.7	67.1	4.8
Total gambling	1.8	1.1	15.2	35.8	49.5	2.6
HARM definition of problem gambler						
EGMs	7.4	4.3	38.5	43.6	64.6	9.4
Total gambling	2.0	3.8	16.7	28.9	48.7	7.3

a The table is based on the Commission's 1999 dataset, which used a survey design likely to reduce the risk of expenditure biases. Though based on the SOGS and HARM definitions of problem gambling, the risk profile associated with spending is likely to carry across to the CPGI. The table shows the share of gamblers who were problem gamblers in each spending category. So, for example, 2.8 per cent of people playing EGMs and spending somewhere between 0 and $3000 annually on EGMs were problem gamblers. But nearly 70 per cent of those EGM players spending more than $12 000 annually were problem gamblers as defined by the SOGS5+ measure. The totals relates to the share of people playing EGMs (or gambling as a whole). Accordingly, using the SOGS5+ measure, nearly one in twenty people playing gaming machines experienced problems with their gambling, compared with around one in forty people gambling in any way.

Source: Productivity Commission (1999), National Gambling Survey.

B.4 Data from existing sources

Other Australian prevalence studies

Some Australian prevalence studies have explicitly requested detailed information about *carefully-defined* spending. The resulting estimates of expenditure shares are broadly in line with the range of estimates described above. Prevalence studies for the Australian Capital Territory (2001), the Northern Territory (2005) and Australia (1999) found that problem gamblers (SOGS5+) accounted for 48.2, 43.0 and 42.3 per cent of total gaming machine expenditure respectively.[9]

[9] Based on prevalence surveys by Tremayne et al. (2001, p. 114); Young et al. (2005, p. 46) and PC (1999, p. 7.46).

The estimates of Livingstone and Woolley

Livingstone and Woolley (2007 and sub. 259 — henceforward L&W) have produced more contested estimates. Using data drawn from a 2004 Victorian survey of venues (Caraniche 2005) and from the Victorian prevalence survey,[10] L&W (2007) estimated that problem gamblers accounted for about 36 per cent of total EGM revenue, with at-risk gamblers accounting for a further 18 per cent.

In contrast, and using the *same* dataset, Clubs Australia (sub. 164, pp. 84–85) claim that the share of spending accounted for by these higher risk groups would be at most 23.1 per cent.

The differences reflect varying assumptions about the spending levels of non-problem (largely *non-regular*) gamblers. Clubs Australia assumes that this group spends $3700 per annum — which is the value estimated by Caraniche for (principally) *regular* non-problem gamblers. (The average spending for *all* EGM gamblers in Victoria at this time was around $1800, and so any credible assumption about the spending of non-regular non-problem gamblers must be a fraction of this.)

Subsequently, and using slightly different prevalence rates based on the Caraniche data, L&W (sub. 259) estimated that problem gamblers accounted for around 29 per cent of total EGM spending (and moderate risk an additional 15.5 per cent). In this set of calculations, L&W found that the average per annum expenditure by non-regular, non-problem gamblers consistent with the observed aggregate spending in Victoria at that time was around $930 a year — a more credible estimate than the $3700 assumed by Clubs Australia.

It should be noted that there are some limitations with the Caraniche dataset for estimating expenditure shares. The sampling method — while appropriate for Caraniche's analysis — was based on a non-random (unweighted) sample of patrons, which favoured selection of higher frequency gamblers (who tend to spend more). This adds to the unreliability of the estimates of L&W, but would be unlikely to undermine the basic qualitative findings.

Data on player behaviour from McDonnell-Phillips

Similar sampling problems beset the national dataset collected by McDonnell-Phillips (2006). The purpose of that dataset was to investigate the behaviour of gamblers, particularly in relation to pre-commitment. The sampling strategy was suited to those research focuses, but less so for assessing the expenditure share of

[10] Centre for Gambling Research (2004a) and Wenzel et al. (2004).

problem gamblers. Consistent with the results above, the data reveal that problem and moderate gamblers spend significantly more than low and no-risk groups (p. 92). However, due to under-sampling of lower frequency gamblers, the study will provide exaggerated estimates of spending for lower risk groups (and probably more accurate ones for problem gamblers who tend to play regularly).

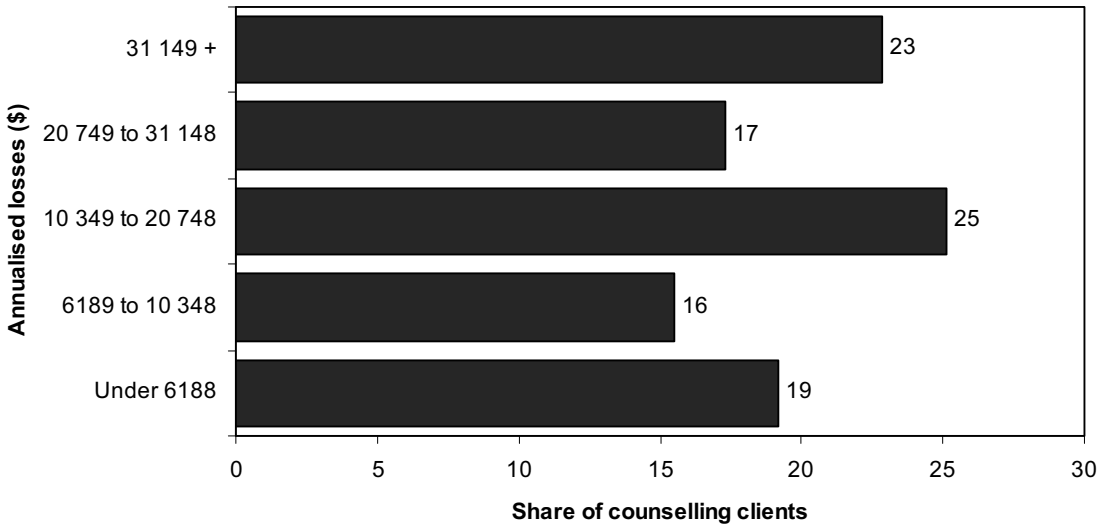
B.5 Other suggestive evidence

Some other information is consistent with high relative spending levels by problem gamblers:

- Surveys of problem gamblers when in counselling suggest very significant spending levels, with for example, nearly one quarter of clients of NSW services reporting losses equivalent to $31 000 or more per year (figure B.2)
- Surveys of fraud routinely find that gambling is a common motivation, and that the associated amounts spent by gamblers using fraudulently acquired funds are very large. KPMG (2009) in its 2008 survey found that gambling was the most common motivation for fraud and that the average loss was $1.1 million per incident. A major survey of court cases, found that gaming machines were the major form of gambling motivating fraud. While the average amounts lost were smaller than for other gambling forms, they were still close to $400 000 (table B.21). It is unlikely that prevalence surveys will pick up such extreme spending amounts.

Figure B.2 **Clients of counselling agencies report large losses**

NSW 2007-08



a The estimated losses of problem gamblers are based on annualising weekly amounts.

Data source: NSW Government.

Table B.23 **Gambling-motivated fraud**

Mode of gambling	*Cases*	*Total amount*	*Average fraud per case*
	Number	$	$
Poker machines	184	64 077 200	348 246
Casinos	74	71 049 056	960 122
Horseracing	27	71 479 603	2 647 393
TAB	18	5 625 330	312 518
Other	23	22 187 352	964 667
Total	326	234 418 541	719 075

a Overall, the study was based on 528 cases of gambling-related fraud. The data relate to only a sub-sample of fraud cases involving each form, as it excludes cases where multiple forms of gambling were implicated in the fraud. For example, there were 203 cases of fraud where poker machines were specifically mentioned, but in 19 of these, other gambling forms were also implicated.

Source: Warfield, B. (2008), *Gambling Motivated Fraud, 1998–2007*, Warfield & Associates.